

Outbreaks of the Apple Red Bug: Difficulties in Identifying a New Pest and Emergence of a Mirid Specialist

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ABSTRACT

In the early 1900's two species of plant bugs (Hemiptera: Miridae), both undescribed, became important pests of apple in New York and other northeastern states. M. V. Slingerland, an economic entomologist at Cornell University, corresponded with the leading North American hemipterists in an attempt to obtain a name for one of the bugs, *Heterocordylus malinus*. Although the so-called apple red bug was recognized as new to science, the actual description was left to the European specialist O. M. Reuter. The problem in obtaining a name to be used in a paper on life history reveals the immature state of mirid taxonomy in North America at the beginning of the century. Correspondence between Slingerland and P. R. Uhler, E. P. Van Duzee, and O. Heidemann is discussed, and it is suggested that the episode may have helped influence H. H. Knight to become North America's first specialist in Miridae. It also is shown that Slingerland validated the name *Heterocordylus malinus* in a note on its injury to apple. Because his paper predated the publication of Reuter's formal description, authorship should be credited to Slingerland.

In the first decade of the 20th century two plant bugs of the family Miridae rose from obscurity to threaten New York's apple industry. *Heterocordylus malinus* Reuter, at first called the apple red bug, and *Lygidea mendax* Reuter, the false apple red bug,¹ attracted the attention of orchardists who sought help from entomologists at Cornell University.

Cornell's Mark Slingerland had been aware of *H. malinus* since 1896 and had observed its habits, but it took an outbreak near Syracuse, New York, in spring 1908 to prompt more intensive studies. Unfortunately, his premature death kept him from completing the work. After Slingerland's death in 1909,² Cyrus Crosby continued the research and made extensive use of his colleague's preliminary notes and photographs to provide the first life history information.³ Soon entomologists in the Northeast described their efforts to control the red

bugs; 43 papers appeared during 1915-19 at the peak of research activity.⁴ Today these once prominent pests are unfamiliar to growers and to most entomologists associated with the apple industry; both mirid species are suppressed by current management practices.

Some 65 years after the initial outbreak, a present-day entomologist, C. W. Schaefer, reflected on and proposed explanations for the red bugs' "sudden rise, brief glory, and swift fall."⁵ As a native insect, *H. malinus* most likely was associated with wild rosaceous hosts like species of hawthorn (*Crataegus*). In western New York it may have adopted apple as a host when this immigrant tree was planted extensively in the mid-19th century. Improved horticultural practices, rather than the greater number of trees, brought increased productivity; thus the fruit and succulent foliage of apple may have offered a more fa-

avorable environment than provided by the original hosts.⁶

Schaefer's fascinating account of the rise and fall of the apple red bugs complemented the numerous and, necessarily, terse reports of entomologists faced with the urgency of combating a new insect problem. A story yet untold is the difficulty Slingerland encountered in getting the bugs identified. It involved more than merely sending specimens "to an expert in far-away Finland."⁷ The account that follows describes the effort needed to secure a name for *H. malinus*, admittedly a lesser pest than *L. mendax*,⁸ but the species for which old notes and correspondence are available.⁹ My historical research also revealed that Slingerland unintentionally validated the name *Heterocordylus malinus* before Reuter's formal description appeared; hence, authorship of the species should be credited to Slingerland.

Identifying a New Pest

When Professor Slingerland encountered the apple red bug in early 1896, he logically turned to P. R. Uhler of Baltimore, Maryland, for an identification. Uhler was North America's first specialist in the Hemiptera-Heteroptera and for many years the only American authority available to make determinations. "Like nearly all great naturalists, he was a most helpful man; no worker appealed to him in vain. . . ."¹⁰ Slingerland sent material to Uhler and learned that although the new pest had been observed previously, it apparently was undescribed.

The insect you have sent to me in the little phial is a Capsid which has been known to our eastern entomologists for at least fifty years, but which appears to be still unpublished. Some years since I recognized it as forming a new genus for which I selected the name *Prodinia*, having reference to its bad habits as recognized by Dr. Fitch, near Salem, N.Y. He has not, however, published his observations on it. I have sent out a few specimens under the name *Prodinia strigata*

Uhler, Ms. The description has long been ready for the press, but I have held it back to go in a longer paper on the Capsidae. If you desire to describe it, do so, but if not, I will send you the diagnoses to print in your memoir. . . .

Can you, possibly, save a series of the two sexes for me. It is a form not yet discovered in Maryland, and it may belong to the Canadian Fauna. I have two specimens from northern Illinois. Fitch's manuscript name for it, *Phytocoris albopunctatus*, was absurd, and I have accordingly changed it. It is widely removed from *Phytocoris*.¹¹

Specimens of *Heterocordylus malinus* bearing Uhler's manuscript name *Prodinia strigata* have not been located, and the conspecificity of Asa Fitch's insect and the one Slingerland collected from apple in New York perhaps could be questioned. But Uhler was a good hemipterist, even if not a specialist in the Miridae. Although he was hampered by poor eyesight, an operation in 1886 restored his sight, and it was not until 1905 that his eyes again began to fail.¹²

The apple red bug did not yet threaten apple production in New York, and Slingerland did not pursue detailed biological studies or publish a description of the species as Uhler said he was free to do. But even before the orchard near Syracuse sustained heavy injury in 1908, Slingerland had sent specimens collected at Syracuse to E. P. Van Duzee, who succeeded Uhler as the leading hemipterist in North America. The material arrived in poor condition, but Van Duzee gave Slingerland essentially the same opinion Uhler had 11 years earlier: "I am very sorry to have to report that this insect is entirely new to me and is probably a still undescribed species of Lopidea. If I were you I would get some perfect specimens and send them to Mr. Otto Heinemann (sic), National Museum, Wash., D.C., and ask him to describe them if they are new. I am no authority on the Capsids but have a fair collection representing something over 220 species of our native forms and have seen many others but your bug is entirely new to me."¹³

Otto Heidemann, Honorary Custodian of Hemiptera at the U.S. National Museum (USNM), figures in the red bug story, although Slingerland may not have sent specimens to Washington. It appears that Heidemann also recognized the red bug as an undescribed species. A specimen from Glen Ellyn, Illinois, housed in the USNM collection, bears Heidemann's handwritten label: "Capsid/new-/near; *Orthocephalus*."

Like Uhler and Van Duzee, Heidemann did not describe the species, perhaps because he was unsure of the correct generic placement, and sent the Illinois specimen to the Finnish hemipterist O. M. Reuter. A final judgment on the mirid's status thus was left to the acknowledged world's authority on the group,¹⁴ who also had received material of the new species from Mr. Van Duzee. After Van Duzee received Reuter's opinion, he informed Slingerland of the results: "You may recollect that about July 1st you send me for identification a Capsid you said was injuring apples which I reported to be probably an undescribed species of Lopidea. A short time after that I took a few examples on wild apple trees at Colden, N.Y. and sent them to Prof. Reuter of Abo, Finland and he reports them to be a new species of *Heterocordylus* which he will describe as *H. malinus*. I send this notice so in case you wish to publish any notice of the species you can give it the proper name."¹⁵

In spring 1908 when red bug populations at Syracuse reached alarming levels, Slingerland wanted to publish his biological observations. He continued to ask Mr. Van Duzee about the status of Reuter's proposed description and to send additional specimens to Van Duzee for identification. In June 1908 Van Duzee replied that he had not yet received determined specimens from Reuter but that Slingerland could proceed with his plans for publication, using the name "*Heterocordylus malinus* Reut., perhaps with the statement that the description is expected to appear in a paper to be published by Dr. Reuter this summer."¹⁶

Reuter's description, which was not published until the following year, was based

on specimens from Colden, New York, and Glen Ellyn, Illinois.¹⁷ However, before the formal description had appeared, Slingerland used the name *H. malinus* in a talk given to the Western New York Horticultural Society in January 1909. Slingerland's paper, published later that year in the society's *Proceedings*,¹⁸ predated Reuter's description.¹⁹ Slingerland referred to the new apple pest as a "vermillion-red" bug that attacked the unfolding leaves; later, the recently set fruits.²⁰ He noted that Reuter had named it *Heterocordylus malinus*. Although Slingerland had no intention of validating the name, his photograph of a late-instar nymph establishes the identity of the species, and his "description," albeit brief, is sufficient to validate the name.²¹ I propose that the correct designation for this species is *H. malinus* Slingerland.

After Slingerland's death, Prof. Crosby sent additional specimens of both red bug species to Van Duzee for identification.²² *H. malinus* is quite variable in coloration, and apparently Crosby was not certain whether the extreme dark color form represented the same species.

Historical Interpretation

The difficulty Mark Slingerland encountered in obtaining a name for one of the new apple pests reveals the immature state of mirid taxonomy in the early 20th century. Today, when a new insect problem arises in North America it usually is easy to identify the pest, or at least to place it to genus. Such was not the case for the Miridae when the red bugs gained prominence. P. R. Uhler and E. P. Van Duzee worked with nearly all groups of Hemiptera; both had described new mirids, including some of the most common North American species, but neither specialized in the group.²³

The struggle to get the red bug identified may have significance for the effect it had on Harry H. Knight, a student of Crosby's who was to become the first North American miridologist. He certainly was familiar with the red bug outbreaks; he commented

in 1915 that the "rapid development of both species as pests has been quite remarkable."²⁴

Knight entered Cornell in September 1910, having already completed two years of undergraduate training at the State Normal School in Springfield, Missouri (now Southwest Missouri State University). He began collecting mirids in 1911,²⁵ the year Crosby published the first substantial biological data on apple red bugs. It probably was Crosby who encouraged Knight to stay at Cornell for graduate work and to characterize insect injury to apple fruit as his thesis research.²⁶

Harry Knight soon encountered mirids on apple other than the red bugs and discovered that no one in North America could identify the species he collected. To fulfill what he saw as an urgent need for mirid identifications, Knight decided to specialize in the group.²⁷

Knight soon dominated the family, his accomplishments between 1915 and 1923 termed "one of the astonishing episodes in the history of hemipterology."²⁸ He continued active taxonomic work until his death at the age of 87 on 6 September 1976.²⁹ In his distinguished career he published about 180 papers on the Miridae and described some 1,200 new species. One might wonder whether Harry Knight might have turned to the systematics of some other insect group, or even to another area of entomology, had it not been for the apple red bugs and the taxonomic problems they posed for Professor Mark Slingerland.

Maryland, for supplying information which established that Slingerland's description predated Reuter's. For offering helpful comments on earlier versions of the manuscript I acknowledge T. J. Henry, Systematic Entomology Laboratory, USDA, c/o National Museum of Natural History, Washington, DC; C. W. Schaefer, Biological Sciences Group, University of Connecticut, Storrs, CT; and K. Valley, Bureau of Plant Industry, Pennsylvania Department of Agriculture, Harrisburg, PA. Access to Slingerland's "Experiment File" at Cornell University was provided by E. R. Hoebeke and L. L. Pechuman, Department of Entomology, Cornell University, Ithaca, NY.

References Cited and Notes

1. When *Heterocordylus malinus* was referred to as the apple red bug (or redbug), *Lygidea mendax* often was called the bright or false apple red bug. Probably because of its greater economic importance, the latter species was given the approved common name "apple red bug" and *H. malinus* was then called the "dark apple red bug." Although the Entomological Society of America retains "apple red bug" for *L. mendax* and does not currently list an approved name for *H. malinus*, I will use "apple red bug" in its original sense, i.e., for *H. malinus*.
2. Mark Vernon Slingerland, who died of Bright's disease on March 10, 1909 at the age of 44, was a prolific writer and a leader in the relatively young field of economic entomology. J. H. Comstock, "Mark Vernon Slingerland," *J. Econ. Entomol.* 2(1909), 195-196. For a list of Slingerland's writings, see M. D. Leonard, "A Bibliography of the Writings of Professor Mark Vernon Slingerland," *Cornell Univ. Agric. Exp. Stn. Bull.* 348 (1914), 625-651.
3. C. R. Crosby, "Notes on the Life-History of Two Species of Capsidae," *Can. Entomol.* 43 (1911), 17-20 and "The Apple Redbugs," *Cornell Univ. Agric. Exp. Stn. Bull.* 291 (1911), 213-230. Cyrus R. Crosby (1879-1937) was a well-known economic entomologist who worked in his spare time on spider taxonomy. A. Mallis, *American Entomologists* (New Brunswick, N.J.: Rutgers Univ. Press, 1971), pp. 420-421.
4. C. W. Schaefer, "Rise and Fall of the Apple Redbugs," *Conn. Entomol. Soc. Mem.* (1974), 104.
5. *Ibid.*, p. 110.
6. *Ibid.*, p. 110-111. See also R. A. Cushman, "The Native Food-Plants of the Apple Red-Bugs," *Proc. Entomol. Soc. Wash.* 18 (1916), 196; W. H.

Acknowledgments

Crucial to the completion of this paper was the dating of Reuter's description of *Heterocordylus malinus*. Thanks to the efforts of Antti Jansson, Zoological Museum, University of Helsinki, Helsinki, Finland, I was able to pinpoint the beginning of the delivery for volume 36 of *Acta Soc. Sci. Fenn.* I am grateful to him for his invaluable assistance. I also thank the staff of the National Agricultural Library, Beltsville,

- Wellhouse, "The Insect Fauna of the Genus *Craetagus*," *Cornell Univ. Agric. Exp. Stn. Mem.* 56 (1922), 1054-1055; and P. J. Chapman and S. E. Lienk, "Tortricid Fauna of Apple in New York (Lepidoptera: Tortricidae)," *N.Y. Agric. Exp. Stn., Geneva Spec. Publ.* (1971), 4-8.
7. M. V. Slingerland, "A Red Bug on Apple," in *Proc. Fifty-fourth Annual Meeting of the Western New York Horticultural Society*, 1909, p. 91.
 8. The overwintered eggs of *H. malinus* hatch 7-10 days earlier than those of *L. mendax*. Thus, the developing nymphs feed primarily on young foliage and usually reach maturity before fruit is large enough to be injured. H. H. Knight, "An Investigation of the Scarring of Fruit Caused by Apple Redbugs," *Cornell Univ. Agric. Exp. Stn. Bull.* 396 (1918), 198, 200.
 9. The Slingerland and Crosby material, part of extensive experiment files preserved in the Department of Entomology, Cornell University, Ithaca, N.Y., is labeled "Capsid (?) on Apple — Expt. No. 554."
 10. L. O. Howard, "Philip Reese Uhler, L. L. D.," *Entomol. News* 24 (1913), 436.
 11. P. R. Uhler to M. V. Slingerland, June 3, 1896.
 12. Howard, "Philip Reese Uhler," p. 437.
 13. E. P. Van Duzee to M. V. Slingerland, July 2, 1907.
 14. Odo M. Reuter (1850-1913), a linguist, poet, and philosopher, was an outstanding entomologist who published nearly 500 papers, including several monographs on Miridae. O. Heidemann, "O. M. Reuter," *Proc. Entomol. Soc. Wash.* 16 (1914), 76-78. For a more detailed biography see J. Sahlberg, "Odo Morannal Reuter. Nagra Minnesord," *Entomol. Tidskr.* 38 (1917), 62-96.
 15. E. P. Van Duzee to M. V. Slingerland, Oct. 26, 1907.
 16. E. P. Van Duzee to M. V. Slingerland, June 15, 1908.
 17. O. M. Reuter, "Bemerkungen über nearktische Capsiden nebst Beschreibung neuer Arten," *Acta Soc. Sci. Fenn.* 36 (1909), 71. On p. 47, *Lygidea mendax* was described on the basis of specimens E. P. Van Duzee had collected at Colden, Gowanda, and Hamburg, N.Y.
 18. Slingerland, "A Red Bug on Apple," pp. 90-91.
 19. Slingerland's paper appeared early in 1909. A copy in the National Agricultural Library, Beltsville, Maryland, bears an accession stamp; it was received 8 April 1909. The publication date of Reuter's description can be determined more precisely. In the minutes of the Societas Scientiarum Fennicae for 20 September 1909 is the following statement: "Printing of volumes 35 and 36 of Acta Societas Scientiarum Fennicae have been completed and the volumes are ready for distribution." Antti Jansson to A. G. Wheeler, Jr., April 7, 1983.
 20. Slingerland, "A Red Bug on Apple," p. 90.
 21. Similarly, some of P. R. Uhler's manuscript names were validated by Otto Heidemann. For a discussion of what represents an adequate description, see A. G. Wheeler, Jr. and T. J. Henry, "Recognition of Seven Uhler Manuscript Names, with Notes on Thirteen Other Species Used by Heidemann (1892) (Hemiptera: Miridae)," *Trans. Am. Entomol. Soc.* 101 (1975), 355-356.
 22. E. P. Van Duzee to C. R. Crosby, May 6, 1910.
 23. See J. A. Slater, "Harry H. Knight: an Appreciation and Remembrance," *Melsheimer Entomol. Ser.* 24 (1978), 1.
 24. H. H. Knight, "Observations on the Oviposition of Certain Capsids," *J. Econ. Entomol.* 8 (1915), 293.
 25. H. H. Knight, "A New Key to Species of *Reuteroscopus* Kirk. with Descriptions of New Species (Hemiptera, Miridae)," *Iowa State J. Sci.* 40 (1965), 101.
 26. H. H. Knight, "Studies on Insects Affecting the Fruit of the Apple with Particular Reference to the Characteristics of the Resulting Scars," *Cornell Univ. Agric. Exp. Stn. Bull.* 410 (1922), 447-498.
 27. H. H. Knight, "Forty Years of Progress on the Classification of Family Miridae (Hemiptera)," *Proc. Twelfth Annual Meeting, North Central Branch, Entomological Society of America* (1958), 27.
 28. Slater, "Harry H. Knight: an Appreciation and Remembrance," p. 2.
 29. T. A. Brindley, "Harry H. Knight, 1889-1976," *J. Econ. Entomol.* 69 (1976), 792. For additional information on Knight's mirid work see Slater, "Harry H. Knight: an Appreciation and Remembrance," pp. 1-8; A. G. Wheeler, Jr., "A Comparison of the Plant-Bug Fauna of the Ithaca, New York Area in 1910-1919 with That in 1978," *Iowa State J. Res.* 54 (1979), 29-35; and A. G. Wheeler, Jr., "Plant Bugs at Cornell: a Changing Fauna," *Cornell Plantations* 36 (1980), 3-8.